The Cary Arboretum

of The New York Botanical Garden

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Arboretum Advice to Egypt

Dr. Thomas S. Elias, Assistant Director of the Arboretum, was one of the main speakers at the first International Workshop on the Management of Wildlife in Arid Ecosystems held during the first week of November in Cairo, Egypt.

In his prepared remarks, Dr. Elias pointed out that 67% of Egypt's flora are rare and many of the species are even in danger of becoming extinct. Botanists are concerned that no national program of protection or preservation has yet been enacted in that country. The Egyptian Academy of Sciences invited representatives from 15 countries to discuss the issue, with the hope that the conference would stimulate Egyptian leaders to initiate a conservation program.

Dr. Elias' proposals included several suggestions for saving Egypt's endangered flora. He proposed a "priority scale" which would, initially, attempt to save potential food and medicinal plants along with some biologically important species that are vital to understanding the evolution of Egyptian plant life. For example, the well-known Egyptian papyrus plant (the source of the first paper ever produced), almost became extinct in its native country. Fortunately, efforts are now underway to protect the last stand of papyrus and to propagate it.

In addition, Dr. Elias recommended that an Egyptian national park system be established for the preservation of native flora. He said that several botanical gardens should be created throughout the country because they also can play a major role in the preservation, research, and propagation of endangered species.

At the conclusion of the conference, participants passed a series of resolutions urging that 10% of the land be set aside for parks and gardens, including several outstanding areas in the Sinai peninsula.

Mrs. O'Brien Leads Annual Gift Appeal

The Cary Arboretum, for the first time in its seven-year history, has asked its members and the public to make donations to its operating budget.

A campaign for donations was announced in a letter signed by Sally Gifford O'Brien, Chairman of the Annual Giving Appeal. The letter was mailed in early December to the Arboretum's members and other interested persons in the Dutchess County area.

Mrs. O'Brien's letter explained that the Mary Flagler Cary Charitable Trust, which established the Arboretum as a branch of the New York Botanical Garden, "has been extremely generous in building the Arboretum for our use and enjoyment. It can provide, however, only three-quarters of the annual support needed. For the present year the projected budget is $1,341,444, of which $1,000,000 is available from the Cary Trust."

The letter went on to say that "the additional one-quarter of the budget makes possible the educational programs and cultural events, pays for children's visits and tours, and is essential for many research programs investigating the relationship between plants and people in modern environments."

The appeal letter stated that government and foundation grants provide $151,444 of the balance needed, and funds received from membership dues, publications and sales in the Cary gift shop total $90,000. Mrs. O'Brien's letter concluded: "The balance of $100,000 must be sought from those who believe in the Arboretum's programs and who will support it with their gifts."

Donations to the Cary Arboretum are tax deductible.

Programs at the Arboretum include studies of ecology, deer biology, orchard protection, plant structure, energy management, rights-of-way management, street trees, Dutch elm disease, plant relationships, pollution sensitivity of trees, and solar energy, as well as horticultural displays, education for young and old, hiking trails, and other recreational and cultural activities.

Mrs. O'Brien, a resident of Millbrook and the wife of C. William O'Brien, spent her girlhood in the Gifford House, the handsome Federal-period structure that now houses the Arboretum's Education and Visitor Center. She is the author and illustrator of a booklet published by the Arboretum, called "A Gifford House Memory Sampler."

"Nectar" is the name of the game for this well-fed security guard. See story inside . . .

Photo by Charles Porter

Microtechnique: The World Within A Cell

by Robin Parow with thanks to Lydia Newcombe

"Research", one of the key words used in describing the Cary Arboretum, is basic to the purpose of the Arboretum – whose function, after all, is to educate the public while at the same time striving to achieve a better environment through an increased knowledge of plants.

Within the thick walls of the new solar-heated Plant Science Building, Lydia Newcombe is typical of the dedicated research staff. Working under the supervision of Dr. Thomas Elias, she conscientiously devotes her time to plant research, delving – literally – into the tiny cells of plant tissue, in an attempt to answer questions about links in the puzzling chain of evolution.

As a research assistant, Ms. Newcombe studies evolutionary relationships of plants on the basis of their physical structure. Specifically, her work is focused on the nectary, a gland which secretes a sugary nectar that attracts insects to the plants. Examples of plants which contain such nectaries are the *Catalpa* (a tree with a beanlike pod), the *Campsis* (commonly known as the "Trumpet Creeper"), and the *Crescentia* (the Calabash Tree). These members of the Bignoniaceae family are believed to be among the most advanced species of plants because they have nectaries that are independent of the floral nectary which attracts pollinating insects.

Experimental results have led scientists to believe that plants bearing nectaries can be directly associated and benefited by the actions of insects. The nectary of a plant is not absolutely essential to its survival; however, certain species have evolved this special gland that secretes nutritious nectar utilized by ants which, in turn, protect the plant from other insects. Such behavior is not as altruistic as it appears; each organism is simply fulfilling a need of its own while at the same time providing a service to another. In scientific terms, this "cause and effect" is known as a symbiotic relationship.

A clear example of such interdependence can be found in the interactions of ants and peonies *(Paeonia)*. If you have ever taken a careful look at these beautiful red, pink or white flowers in their natural environment, you will have noticed an abundance of ants on the buds. These insects are feeding on the bud's nectar while fighting off other herbivorous insects that might be potentially harmful to the host flower. Some tropical plants such as the Bull's Horn acacia, Tank bromeliad *(Tillandsia)*, and several members of the rose, orchid and pineapple families also provide "dormitories" for their insect friends in the form of a hollow leaf-pouch or thorn. The "live-in" guests in these cases receive both room and board in return for their security services to the host plant. Such interactions of plants and insects are not random coincidences or "freaks of nature", but they are, rather, the mechanics of evolution. And this is where scientific research is applied.

The average nectary, which is smaller than the head of a pin, is measured in microns or thousandths of a millimeter. It is prepared for observation through a procedure called microtechnique – the science of histology – in which slices of tissue specimens can be studied, measured and photographed in detail on a slide under a microscope. The procedure necessary to transfer a leaf

Enlarged 200 times, the nectary is shown inbedded in the leaf's epidermis. Photo by Lydia Newcombe

nectary from its natural state into a tiny, yet completely preserved slide specimen, is an extremely complex, albeit most interesting one:

The leaf of a plant whose nectary is to be studied is immersed for a minimum of 18 hours in a solution of acetic acid, formaldehyde and alcohol. This formula immediately terminates the chemical processes of the living tissue while simultaneously retaining good preservation of the leaf's cellular structure.

Following this lengthy immersion, the leaf is cut into several small pieces, each of which contain a part of the plant's nectaries. A dehydration process then removes water from the tissue through a graded series of alcohol solutions ranging from 50% to 100%. In order to prevent tissue collapse during slicing, this dehydration process is followed by infiltrating the cellular spaces with melted paraffin wax, which replaces the alcohol. The entire tissue is then encased in paraffin and formed into a block which is now ready for slicing.

Cross-sectioning, or slicing of the tissue, is done on a microtome – a small, ratchet-type mechanism which advances the tissue block towards a fixed blade that cuts the material into regular slices that are between eight and 10 microns each. The moment of contact between the blade and the paraffin block creates just enough heat to cause these tiny slices to adhere to each other, thus creating a "filmstrip effect" – possibly the smallest scientific "filmstrip" ever made . . . When mounted on glass slides, this continuous series of cross-sections serves two purposes: (1) It enables the researcher to observe each individual slice or "frame" of the strip; and (2) The order in which these microscopic cross-sections occur yields information on the structural pattern of the as yet little known sugar nectary.

Lydia Newcombe studies a nectary cross-section under the microscope. Photo by Robin Parow

The staining of the slide is only a beginning step in the photographic process. Even a high-speed, high-contrast film cannot render the different cells of a tissue without the use of dyes which highlight areas for microscope observation and photomicrography. This staining process is accomplished through the use of synthetic red, green or violet dyes made from coal tars, and natural dyes such as the purple Hematoxylin solution which is a product of Logwood *(Hematoxylin campechianum)*. The alcohol and dye baths are used in a sequence of 23 graduated steps, in order not to damage the delicate cell tissues. Within approximately 20 hours, the permanently-dyed specimen can be preserved and cemented with a balsam/xylene solution and a glass cover. It is believed that this final step in the lengthy process protects the slide from deterioration for about 25 years.

As depicted here, an example of black-and-white photomicrography is an exciting sample of the world within a plant cell. The identities of the nucleus and cell walls are enhanced by the dyes. Although the aim of this photo-documentation is to produce an objective, accurate representation of the tissue itself, natural forms and designs frequently create dramatic visual effects that capture artistic attention as well.

The photographic apparatus used in photomicrography consists of a 35 mm camera attached to a microscope that renders magnifications from X20 to X1000. Normal darkroom procedures are used to produce the final product of a positive print – a result that combines years of research aided by advanced laboratory equipment.

With the nectary now isolated, preserved and photographed, research has taken us one step closer to an understanding of the evolution and use of this specific gland. What have we learned in the course of such meticulous research? Where do we go from here? Lydia Newcombe sums it up succinctly: "You have to know how a thing is made before you can learn the essentials of its function, as a mechanic understands an engine. Knowing the structure of the gland and its association with the tissue or types of cells surrounding it, is a place to start."

Similar studies are now underway in the botany departments of the Universities of Wisconsin, Kansas, Michigan, Texas, Berkeley, Texas, Iowa and North Carolina, as well as in such far-flung areas of the world as Western Australia, Germany, Switzerland and Canada. Moreover, an exchange program has been established with other botanical institutions, and plant specimens are now sent to the Arboretum from the tropical habitats of Colombia, Guatemala and Brazil.

The Cary Arboretum has become a major center for nectary research, and it works closely with the above-mentioned laboratories by exchanging information acquired from field studies, chemical analysis, entomology, plant physiology and other nectary-bearing plants. Collaborators in this research have recently produced a book, *Biology of Nectaries,* which will soon be published by Columbia University Press and edited by Dr. Elias. It will serve as a basic reference for biologists studying secretory structures in the plant world.

More Music Planned for Cary

The Music Committee of the Cary Arboretum, composed of volunteers, held its first musical event before Christmas, a highly successful family holiday party.

Favorite Christmas music was played by a brass quintet from the Hudson Valley Philharmonic, and nearly a hundred adults and children joined in a community sing, rendering familiar Christmas carols under the leadership of Willard W. Payne.

The birds who inhabit the Arboretum also enjoyed the occasion. Guests brought popcorn, bird seed, suet and other avian goodies to hang on outdoor trees at the entrance to the Plant Science Building. Inside, there was punch and cookies, as well as a gingerbread house from the Culinary Institute of America, for the enjoyment of the non-winged guests.

The Music Committee has already made basic plans for a series of five outdoor and indoor concerts at the Arboretum next summer. The tentative outdoor schedule that has been set includes the Hudson Valley Philharmonic Orchestra June 3, with Imre Pallo conducting; H.V. Brass Quintet June 17 and Hudson Valley Dance Company with H.V. Scott Joplin Band July 1. The two indoor concerts to be held in the Plant Science Building will be a special recital July 15, (details to be announced later); and the Filigree group (flute, harp, cello) July 29.

Ticket prices will be set lower than last year with subscription prices to all five concerts for $25 ($22.50 for members of Arboretum Friends, and senior citizens); $10 for children. Season tickets may be used at any concert and in any combination (for example all five tickets may be used at one concert). Individual concert tickets will be $6 ($5.25 for an Arboretum Friend, or senior citizen), $2 for children.

Will Human Hair Repel Deer?

The Arboretum has received a grant to support research on use of balls of human hair to repel deer, a novel damage prevention method that the Arboretum has been experimenting with for more than a year.

Seligman & Latz, Inc., a publicly-owned corporation that operates beauty salons, cosmetic and fine jewelry departments in leading department and specialty stores around the world, will supply the Arboretum with hair cuttings from its salons for use in scientific testing, and is underwriting the costs of the investigation.

The grant award was featured in the Science section of "The New York Times" on December 19.

Wildlife experts at the Cary Arboretum have been testing the deer-repellent properties of human hair on ornamental shrubs and nursery seedlings. Handfuls of hair obtained from local barbershops have been wrapped in nylon netting, tied with a string, and then these small "hair ball" packages have been hung on the branches of shrubs and young trees that might sustain damage from browsing deer.

In every case so far, the deer have been repelled when they approach within about one yard of the hair balls. From these preliminary observations, the Arboretum designed more comprehensive field tests to determine whether the hair balls would work more generally to protect tree nurseries, fruit orchards, vineyards, household plantings, vegetable farms and gardens. The tests will examine the effectiveness of various types of hair, how long individual hair balls are effective as repellents, and packaging and application techniques appropriate for protection of conifers, hardwood trees, shrubs, vines and herbaceous plants.

Human hair as a possible repellent offers the advantages of being inexpensive, readily available, non-toxic to humans or animals, and fully biodegradable. Moreover, it makes no use of non-renewable resources and is, in fact, a waste product of everyday life.

The Seligman & Latz grant will enable the Arboretum to conduct definitive tests of these qualities of human hair as a repellent.

The research program on deer repellents is conducted for the Arboretum by members of its wildlife staff, students and volunteer helpers, supervised by Jay McAninch, the Arboretum's Wildlife Biologist.

"Plant Show '79"

Reserve March 1-4 for the second annual "Plant Show '79", to be held at the Mid-Hudson Civic Center, Poughkeepsie, New York.

The show will feature "Green World" displays by the Cary Arboretum, plus exhibits by the Community Cultural Center, Dutchess County Cooperative Extension, and the Horticultural Industry Association.

Visitors to the annual spectacular will experience the brilliant colors and fragrant aromas of Spring. They will have ample opportunity to speak with the experts about gardening pleasures or baffling gardening questions. An additional feature will be an innovative series of horticultural films which will be shown during the four-day exhibit.

You can save 50¢ on your admission ticket by picking up a free discount coupon at the Cary Gift Shop in the Gifford House Education and Visitor Center on the Sharon Turnpike, Millbrook.

"Plant Show '79" will be held Thursday, March 1 from 12-6 p.m., Friday and Saturday March 2-3 from 12-9 p.m., and Sunday, March 4 from 12-6 p.m.

People at the Arboretum

Linda Vigars, the newly appointed Arboretum Librarian at the solar-heated Plant Science Building on the Sharon Turnpike.

Meet Linda Vigars . . . The new Cary Arboretum Librarian . . . She is a graduate of SUNY at Albany where she majored in Biology, minored in Chemistry and Math, and earned her Masters degree in Library Science. Her background also includes substitute teaching, tax consulting, customer relations for a sales company, and even some experience in bridal counseling.

Linda, who now lives in Red Hook, has two children: Jenifer (age 7) and Keith (age 10), plus a pet cat named "Bojangles", who lives up to his name by "dancing."

As a member of both the Library Association and the Special Libraries Association, Linda says she "hopes that the (Arboretum) Library becomes more active in its public role". Accordingly, several significant changes have already taken place under her aegis. For example, the recently-established circulating library allows members of Friends of the Cary Arboretum to borrow books whose subjects range from organic gardening to solar energy, and take them home to read.

In addition to her professional interests, Linda enjoys sailing, skiing, traveling and volunteer work with the handicapped. Last summer she also served as an assistant editor, compiling an index of journals devoted to the subjects of running and marathons. It was published in November.

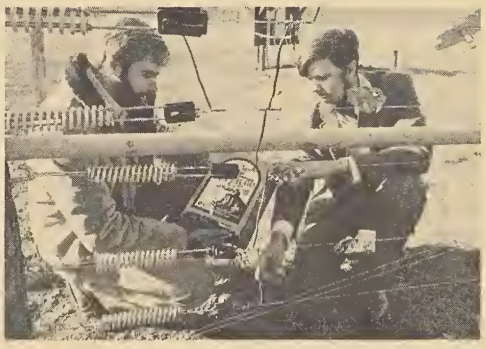
You are welcome to visit the Cary Arboretum library and meet Linda Vigars Monday through Friday 9 a.m. to noon and 1 p.m. to 4 p.m., and Wednesday evenings until 7:30 p.m. Her smile and helpfulness are bound to make you a regular visitor.

New Design for Deer Fencing

A new design for "outrigger"-type fencing to protect young specimen plantings from deer damage is currently being tested in the research field at the south end of Cary Drive.

This latest version of the existing fence incorporates the same effective slanted design and "entrapment" principle as the original fence, but it also contains several new and imaginative ideas suggested by Henry Swayze of Brookside Fencing Co., in Tunbridge, Vermont.

According to Wildlife Biologist Jay McAninch, the "low profile" and comparatively unobtrusive fence that has been used for the past year worked on a slanted wire-and-pole design. This version of the fence sloped from a height of four feet on the outside to ground level inside. This created an overhang seven feet wide which deer could not jump, though there were occasional attempts by deer to break through to reach the field of seedlings inside the fence. Only one deer succeeded last winter and was escorted out.



Jay McAninch and Henry Swayze inspect the new outrigger fence and powerpack. Photo by Robin Parow

The revised model now being tested reenforces the concept of a physical barrier by combining a safe, yet effective, electrical shock with a new spring-loaded type of wire fencing which is more durable and stronger than the wire that was previously used. Unlike its predecessor, 18-inch springs on this new fence connect the support poles to strands of wire, increasing their ability to support a significant amount of weight without bending or stretching.

Mr. McAninch is optimistic that this new, durable wire, supplemented by the electrical "physical barrier" design, will serve as an efficient deterrent to keep the Arboretum's "resident" deer from entering the field.

Although the spring-loaded concept has been successfully used in Australia and New Zealand, this is the first time that Mr. Swayze's fencing ideas have been incorporated into an outrigger design. If proven effective, it could be a significant help to orchard growers and farmers whose crops are subject to deer damage.

Around the Arboretum

Chemical Ecologist Named to Staff

Dr. Frederick C. Seaman, a post-doctoral research associate in chemistry at Louisiana State University, has been appointed to the position of Chemical Ecologist on the Arboretum staff.

Dr. Seaman, who is 30 years old, earned his Bachelor's degree and a Doctorate at the University of Texas at Austin. He has done research on biochemical variations in cotton as it related to disease and insect resistance. He has also investigated chemical compounds in the *Compositae* family of plants, commonly known as daisies, with special emphasis on the chemical evolution of these plants.

At the Arboretum, Dr. Seaman plans to specialize in chemical properties of woody plants and shrubs. One project on his agenda is to examine the chemical characteristics of plants favored by deer as food, compared to those that deer avoid. Dr. Seaman will also be studying the chemistry of plant specimens brought back to the Arboretum from Russia and China, and comparing them with closely related American species to determine chemical differences.

Shortly after receiving the Arboretum appointment, Dr. Seaman was married to his fiancee, the former Ms. Pat Jackson.

Arboretum Issues Solar Film

The Cary Arboretum's pioneering new Plant Science Building which derives most of its heat from the rays of the sun, is the subject of a 20-minute documentary film.

The film, titled "A Building in the Sun," tells the story of the environmentally designed structure and explains the operation of its unique combination of systems for saving energy.

"A Building in the Sun" was filmed in color over the two-year construction period by Gary W. Griffen, a documentary filmmaker of Rhinebeck, New York, who also wrote and produced the motion picture.

Copies of the film are available to the public by contacting the Public Affairs Department of the Arboretum, Box AB, Millbrook, New York 12545, (914-677-5343), or Griffen Productions, Pells Road, Rhinebeck, New York 12572.

The film was produced under supervision of George Bookman, Director of Public Affairs for the Arboretum.

Note to Cross-Country Skiers

Cross-country skiing on designated trails is a privilege of Arboretum membership. To prevent damage to new plantings, skiers are requested to check before outings with the Visitors Center in the Gifford House, 677-5358.

THE CARY ARBORETUM
of
THE NEW YORK
BOTANICAL GARDEN

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